fancy or an odd quotation. We read also the appendixes, which are of a similar character with the preface; but then there remained the inner layer of the sandwich, which called for a most careful overhauling. Anyone who has read Mr. Dodgson's "Euclid and his Modern Rivals" (cited in our present notice as "E. and R."), is prepared to find close logical reasoning and acute remarks in any work he undertakes, and the reader of this booklet will not be disappointed in these particulars.

Euclid's Twelfth Axiom the author asserts to be *not* axiomatic, *i.e.* he has not met with any "bimanous biped" who accepts it as *intuitive* truth. His quest is to find a better axiom. At first sight—and the illustrative figure meets us on the cover and in other places—one is disposed to grant the truth of the Dodgsonian axiom, viz. that "in any circle, the inscribed regular hexagon is greater than any one of the segments that lie outside it." But the author is not restricted to a paltry *once;* he can equally well grapple with the problem, if his reader will grant that twice, four times, eight times, or, in mathematical parlance, 2^n times, the hexagon is greater than any one of the above-named segments. The principal part of the text consists of five definitions, six axioms, and seventeen propositions. Appendix I. contains alternative proofs of certain propositions consequent upon the general form of the author's axiom. The "distance" between two points figures as a definition ("the length of the shortest path between them") and as an axiom ("the length of the straight line joining them"). Prop. IV. is headed a "Theorem"; we should have thought it was a "Problem." It is:—"Given a triangle: to describe an equilateral triangle which shall "enclose it" (third line from end—for AE read DE). Prop. V. is an important one; it runs thus:—"Given a certain angle; and given that every isosceles triangle, whose vertical angle is not greater than the given angle, has its base not greater than either of its sides; to describe, on a given base, an isosceles triangle having each base-angle equal to the given angle" (line 5 from end, for "DE produced" read "BE produced"). In the corollary to this, the argument seems to us to be scamped: a hasty reader might think that Mr. Dodgson had *assumed* Euc. I. 32. We would close thus:—"Angle AFB is greater than angle ACB, ∴ greater than angle ABC, and *a fortiori* greater than angle ABF." Prop. VI. is all right, but how are the figures to be constructed if $n > 2$? The sum of the angles of a triangle is called, by Mr. Dodgson, its "amount." In Prop. VII. (interchange E and F in dexter figure) he shows that, "if α, β be two 'possible amounts'—that is, 'amounts' belonging to existing triangles—then every 'amount' intermediate to α and β is also 'possible.'" Prop. VIII. shows that there is a triangle whose angles are together not greater than two right angles (line 7 up, p. 17, for "=" read ">"; line 1 up, p. 18, for "ABD" read "ADB"). At this point comes the axiom, and Prop. IX. follows:—"An isosceles triangle, whose vertical angle is one-twelfth of a right angle, has its base less than either of its sides" (the corollary applies Prop. V. above). Prop. X. shows that "the angles of every equilateral triangle are together not less than one-fourth of a right angle." Prop. XI. establishes that "there is a triangle whose angles are together not less than two right angles." This is a long proposition. Props. VIII. and XI. are sound on the hypothesis which Mr. Dodgson seems tacitly to have adopted, viz. that the "amounts" of triangles are all in the same boat, either *all* greater than two right angles or *all* less than the same quantity. Surely it is, *a priori*, conceivable that the "amounts" may be variable, and then how will his proofs hold? Prop. XII. readily deduces, from the *previous reasoning*, that "there is a triangle whose angles are together equal to two right angles." Prop. XIII. proves that there is a quadrilateral figure with all its angles right angles (*i.e.* a rectangle); and Prop. XIV. shows that the opposite sides of such a figure are equal. But, "tell it not in Gath," Mr. Dodgson *takes up the rectangle*—we repeat it, takes up the rectangle—and *reverses* it, "so that A, B, may change places." We do not object, but how about the Irish bull (E. and R., p. 47)? But this is not the only surprise in store, for in Prop. XV., to prove that "there is a pair of lines, each of which is 'equidistant' from the other—that is, is such that all points on it are equally distant from the other line"—he makes a rectangle slide along on a straight line! Prop. XVI. proves that "the angles of every triangle are together equal to two right angles"; and Prop. XVII. winds up the story with showing "that a pair of lines, which are equally inclined to a certain transversal, are so to any transversal."

The appendixes repay perusal. Appendix II. discusses Euclid's axiom, and argues that, "though true in the sense in which *Euclid meant it*, it is *not* true in the sense in which *we take it*." In fact, Mr. Dodgson contends that Euclid "excludes from his view both infinities and infinitesimals, and considers *finite magnitudes* only." This is rightly founded on Euclid's Book X. Prop. I. We cannot go into the matter further here, but commend this and Appendix III. ("How should Parallels be Defined?") and Appendix IV. ("How the Question stands To-day") to any reader who is interested in this crucial question. We can quite sympathize with the author, as in times past we have more than once done our little best in the same direction, when he recounts how, more than once, he, too, has "with clasped hands gazed after the retreating meteor, and murmured, 'Beautiful star, that art so near and yet so far.'" To conclude, Mr. Dodgson is "inclined to believe that, if ever Euc. I. 32 is proved without a new axiom, it will be by some new and ampler definition of *the right line*—some definition which shall connote that peculiar and mysterious property, which it must somehow possess, which causes Euc. I. 32 to be true. Try *that* track, my gentle reader; it is not much trodden as yet; and may success attend your search!"

OUR BOOK SHELF.

Primer of Micro-Petrology. By W. Mawer, F.G.S. (London: Office of *Life-Lore*, 1888)

THE task of introducing the student to any particular branch of science requires such selective judgment, such tact both in saying and in leaving things unsaid, that it is not surprising if many so-called "primers" fall short of the good intentions of their authors. Mr. Mawer, in this little book, presupposes "an acquaintance with the phenomena of pleochroism and the polarization of light," and hence refers only in the briefest manner to the methods employed in the examination of thin mineral

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sections. He also, in his desire to be abreast of current literature, uses such terms as "allotriomorphic," "micro-felsitic," "magma-basalt," without adequate definition or discussion; and in speaking of a "porphyritic ground-mass" he will throw many beginners into confusion. If the student is to seek elsewhere for instruction both in the manipulation of the polariscope and in the use of technical terms, the book must be held to fail in its fundamental object as a primer. It will probably serve well, however, to remind the learner of the broader features that mark out one rock-forming mineral from another. The author, moreover, insists, as befits a geologist, on the purely supplementary character of microscopic study—a warning that seems more than ever needed when micro-petro-*graphy*, by the change of a few letters, has been exalted to the level of a science.

The statements in this book are essentially accurate, and the illustrations, excepting that of ophitic structure, may be useful in recalling diagrammatically what has been seen in actual sections. On p. 32, however, there is an incorrect account of the pleochroism of muscovite, which probably has arisen from a blending of two totally independent notes. On p. 36 the sections of augite should be described as having, not six, but eight sides; and talc reappears on p. 50 as a constituent of protogine granite. The cleavages in drawings on pp. 33 and 36 are not in every case consistent with the descriptions.

G. C.

Theoretical Mechanics. By J. E. Taylor, M.A. (London: Longmans, Green, and Co., 1888.)

So long as examinations on prescribed courses are in vogue, so long, we suppose, will text-books be written for them. The book before us has been prepared chiefly to help those who are studying for the elementary stage of the Science and Art Department's examination in the subject, but it also covers the requirements for London matriculation. There is not much scope for originality in a work of this description, and in looking through it we find ourselves in familiar, well-worn paths.

In his preface, Mr. Taylor states that he has endeavoured to make the subject comprehensible to the beginner, but we are afraid that his efforts to explain the difference between mass and weight will be far from successful. This is always a delicate point to touch upon, but we venture to say that few beginners will be likely to understand the explanation given on page 8. This is as follows:—"Whilst mass is always measured by weight, yet the two terms must be kept distinct, the weight being the amount of force which the attraction of the earth exerts on the mass. If g represent this attraction, W, weight of the body, m, mass, we have $W = mg$." Most beginners are likely to imagine from this that W should be equal to g, instead of to mg.

The book is well illustrated throughout with many new diagrams and several old ones from well-known text-books. Numerous examples, worked and unworked, are also given.

With the exception referred to, the book is on the whole well written, and completely covers the Syllabus. The admirable style in which it has been issued, and its comparative cheapness, will commend it to many teachers.

Instructions for Observing Clouds on Land and Sea. By the Hon. R. Abercromby. With Photographs and Engravings. 22 pp. (London: Stanford, 1888.)

THE phrase *Nascitur non fit* may be applied to cloud observers with almost the same confidence as to poets; at least, such is the experience of most persons who have attempted to teach an ordinary observer to record cloud phenomena.

Mr. Abercromby's pamphlet, however, contains a valuable stock of instruction which may be placed in the hands of intending observers, and will at least indicate to them what they have to observe.

The actual nomenclature of cloud forms used by Mr. Abercromby is that which has been, for the time at least, rejected by the International Committee at the recent meeting at Zürich (NATURE, vol. xxxviii. p. 491), but this is a minor matter. The illustrations of cloud perspective and cloud motion are new and good, while the difference between the motion of advance, the "propagation" of a cloud bank, and the rotation of the clouds within that bank is, for the first time, clearly stated. The importance of the R. point (radiation point), the point towards which the stripes of cirrus converge, is explained.

Mr. Abercromby concludes as follows:—

"It (cloud observing) cannot be learnt in a day, but with a little attention and practice the knowledge is soon acquired. The observer, who begins by taking simple cases of low, fast-moving clouds, till he has fully realized the meaning and importance of R. points, will soon attain such proficiency as will enable him to make valuable observations in the most recent branches of modern cloud science."

Laboratory Manual of General Chemistry. By R. P Williams, A.M. (Boston: Ginn and Company, 1888.)

AFTER a few preliminary matters, including some good rules for students in the laboratory, each two pages of this book has in large type consecutive directions for performing an experiment or exercise. The rest of the two pages is left blank for written notes. One hundred exercises are given, and they are of a quite elementary character. It is a pity that contractions are so frequently used, especially when there is a large amount of vacant space and so small an amount of matter. "Ap.: p.t., 4 rec., t.t., d.t., r.s." indicates to the student the apparatus he needs for the purpose of preparing hydrogen. It would have been better to adopt a recognized system of shorthand throughout, for that would have rendered the book more useful to some and quite useless to others, instead of troublesome to all.

LETTERS TO THE EDITOR.

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Mr. Romanes on the Origin of Species.

WHAT the *Times* said is substantially the same as what Mr. Romanes himself says on p. 366 of his paper: "The theory of natural selection is not, properly speaking, a theory of the origin of species: it is a theory of the development of adaptive structures. Only if species always differed from one another in respect of adaptive structures, would natural selection be a theory of the origin of species. But, as we have already seen, species do not always, or even generally, thus differ from one another." Very well then, I say, if this be true, it shrivels up the part played by natural selection to very small dimensions.

The second part of Mr. Romanes's reply consists of a complaint that when I quoted from his paper the words "natural selection not a theory of the origin of species," I did not see that they were "flatly falsified" by the section at the head of which they stood. I do not see it even now, because the section finishes with what Mr. Romanes oddly calls an "insinuation" "that Mr. Darwin's great work on the 'Origin of Species' has been misnamed." If this insinuation be just, then I further do not understand how Mr. Darwin's reputation for candour is to be saved except at the expense of his intelligence.

In the third part of his reply, Mr. Romanes says "he [Mr. Dyer] must surely be aware that other botanists who have more thoroughly considered the subject are dead against him in his general conclusion." I have perhaps as many opportunities as most men of knowing the opinions of botanists, and I cannot

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